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MARINE ENGINEERING.

Marine Engines and Boilers, their Design and Construction. Based on the work by Dr. G. Bauer. Translated from the second German edition by E. M. and S. Bryan Donkin. Edited by Leslie S. Robertson. Pp. xxviii+744. (London: Crosby Lockwood and Son.) Price 25*s.* net.

THIS considerable work fills a gap in English engineering literature. For while the related subject of naval architecture has been treated by writers of authority, there is no very good modern book on marine engineering. Dr. Bauer states that it is intended to be a condensed treatise, embodying the theoretical and practical rules used in designing marine engines and boilers. But though thus limited in scope, it treats only of the most modern types and excludes even modern engines and boilers of special types. As might be expected from the engineer-in-chief of the Vulcan Works at Stettin, the machinery of warships and of some of the great German Atlantic liners are very fully illustrated. There is not a great deal of theoretical investigation, but what there is bears very definitely on design, and is sound so far as it goes. Perhaps the most valuable part of the book is the great amount of tabulated information about the proportions of the machinery in good examples of modern practice. There is also a very large collection of those empirical or semi-empirical rules, based on extensive practical experience, on which engineers necessarily so much rely. There is reason to be grateful that an engineer so distinguished as Dr. Bauer, with the care of a great factory on his shoulders, should have found time to produce such a systematic treatise, and that he has been able to obtain the aid of some of his principal technical assistants in dealing with parts of the subject.

The book has been excellently and competently translated, and the translators have undertaken the necessary, but very laborious, task of converting the numerical statements of formulæ from the metric to English measures. However bad our English system of measures may be, English engineers can only think and work in English measures, and the translation would have lost very much of its usefulness if the conversion had not been made. Mr. Leslie S. Robertson, who has edited the volume, has had practical experience in this branch of engineering, and has already published valuable works relating to it. His name is a guarantee that the adaptation of the work for English readers has been, from the technical point of view, thoroughly well done.

The general arrangement of the book is convenient. Part i., which occupies four-tenths of the volume, deals with the main engines. First, indicator diagrams are discussed, and the application of theoretical diagrams in settling cylinder proportions. The well known method of constructing theoretical diagrams from a diagram of the volumes occupied by the steam is given, and an example worked out. The remark is made that "the diagrams so obtained show the characteristics of actual diagrams, but their mean pressures are naturally much higher than they would be in actual practice." That is not our experience. If the data are rightly used, there is a fairly close approximation between the theoretical and actual mean pressures. It is a case in which the precise law of expansion assumed does not very much affect the result. There is one other small point in this chapter. The ratio of an actual to a theoretical diagram is called an "efficiency" (p. 17). This leads to the awkward statement on p. 35 that "the efficiency of triple expansion engines is less than that of single cylinder engines." If the more usual term "diagram factor" had been used instead of efficiency the statement would be less misleading.

Next there is a very short section dealing with some thermal circumstances affecting the utilisation of steam. This is too brief to be satisfactory, even from the point of view of engine design. For instance, the loss due to cylinder condensation is explained by saying that "heat is withdrawn from the steam at high pressure and restored to it at a lower pressure" (p. 37). The essential point that the heat is chiefly restored during exhaust is not mentioned. So the economy of multiple expansion engines is traced to reduction of temperature range. But the re-evaporation during exhaust from one cylinder increases the work in the next. In other respects also the explanation is deficient. However, the thermodynamics of steam engines is fully given in other treatises. An important section follows, in which the stroke, speed, and turning moment are discussed. The theory of torsional vibrations is given, and practical methods of determining the critical speed at which liability to strong torsional vibrations occurs. In connection with this there is a brief but clear and practical treatment of the problem of balancing. Then the arrangement of main engines is explained, and there is a long section dealing with the proportions of engine details and including a sufficient account of valve diagrams.

Part ii. deals with pumps. Part iii. discusses shafting, and in connection with this ship resistance, and the proportioning of propellers. German writers are adepts at tabulating coefficients and data, and the tables in this section are excellent. Part iv. is on pipes and connections. Part v. deals with steam boilers, and is chiefly descriptive of modern types. Here again the tabulated data from actual cases is information of the most useful kind, and the rules of the classification societies, which leave the engineer very little discretion, are fully given. The last section gives some account, rather too much condensed, of instruments used in steam engine and boiler trials. To many readers an account of Fottinger's torsion indicator for measuring the effective horse-power of engines by observing the torsion of the screw shaft will be interesting. Hirn first used a torsion dynamometer of this kind. As a diagram of the torsion angle is obtained, the variation of the power transmitted can be determined.

No account is given of the most recent change in marine engineering, namely, the adoption of the steam turbine in place of reciprocating engines. The success of the steam turbine in this field is already so well assured that a revolution in marine engineering is promised. But there are, no doubt, good reasons for the omission. Experience in the use of steam turbines in ships is almost confined to this country, and naturally at present full information as to the results, mechanical and economic, of the use of turbines is only possessed by a few engineers, and is not generally available.

In this country we still rightly pride ourselves on retaining the highest position in shipbuilding and marine engineering. But, if we still do more work of this kind than any other nation, and if our best work is as good as any in the world, yet Dr. Bauer's book should remind us that in science, experience and skill, other nations now run us very close.

THE BIRDS OF ICELAND.

Beitrag zur Kenntnis der Vogelwelt Islands. By B. Hantzsch. Pp. vi + 341; illustrated. (Berlin: Friedländer and Son, 1905.) Price 12 marks.

SINCE Iceland lies on one of the main migration routes, namely, that which starts from Greenland and Iceland itself, and passes by the Færöes to the British Islands, its bird-fauna is naturally of special interest and importance. This is testified by the appearance within a comparatively short period of two works on the subject, namely, Mr. H. N. Slater's "Manual of the Birds of Iceland," published at Edinburgh in 1901, and the present larger and more pretentious volume. In addition to the general fauna, there is special interest attaching to Iceland as the chief European resort in former days of the gare-fowl, or great auk. The history of this lost bird and the literature relating to it the author reserves for a supplemental volume. Despite all that has been done by travellers and collectors, Mr. Hantzsch is of opinion that our knowledge of the bird-fauna of Iceland is still far from complete, much of the interior of the country being difficult of access and still imperfectly explored by collectors. Accordingly he is fain to admit that the last word on the subject still remains to be said.

The volume commences with an historical survey of the growth of our knowledge of Icelandic ornithology, with notices of the chief explorers and workers in this field of research, and a list of the more important memoirs and books treating of the subject. Then comes a detailed account of the author's own journeys in the island for the purpose of collecting specimens and personally observing the birds. This is followed by an interesting description of the main physical features of Iceland and the neighbouring islets, such as Grimsey in the north and the Westman group in the south, this being illustrated with a number of reproductions of photographs of the scenery taken by the author himself. Special lists are given of the birds of Grimsey and the Westman Islands. Changes in the bird-fauna of the whole group of islands, and the general relationships of the fauna form the subjects of two succeeding chapters, a brief note being appended on domesticated species.

This completes the introductory portion of the subject, which occupies ninety-two pages, and the remainder of the text is devoted to the detailed synopsis of the birds. The total number of species, exclusive of the great auk, recorded in the preliminary list as definitely known to occur in Iceland is 120, in addition to which are a few of which the right to a place among the fauna is somewhat uncertain. Perhaps the most striking feature of the descriptive part of the work is the almost painful severity with which new fashions in ornithological nomenclature are followed, such appalling alliterations as *Merula merula merula* and *Gallinago gallinago gallinago* occurring with wearisome frequency. Without reiterating his own private opinion on nomenclature of this nature, which is now pretty well known, the reviewer may point out that when the typical form of a species is alone recorded, it is perfectly superfluous to add the terminal trinomial, *Merula merula* and *Gallinago gallinago* being in such cases apparently all that can possibly be required.

Excellent photographs of the eggs, nests, or breeding-haunts of some of the rarer species serve to enliven the text, and ornithologists will be greatly interested in the two pictures of the eggs and callow young of the great skua in their natural surroundings. The work will doubtless long remain the standard authority on Icelandic birds, at all events for German readers. R. L.

OUR BOOK SHELF.

Neue Fische und Reptilien aus der böhmischen Kreideformation. By Prof. Dr. Anton Fritsch and Dr. Fr. Bayer. Pp. 34; plates ix. (Prague: Fr. Rivnac, 1905.)

VERTEBRATE fossils are not only rare, but also badly preserved, in the Cretaceous rocks of Bohemia. Palæontologists must therefore admire the enthusiasm of Dr. Anton Fritsch, who continues to devote to the interpretation of difficult fragments so much study as is evidenced by his numerous writings on these remains. In 1878 he published a complete synopsis of the subject as then understood. Now, with the aid of Dr. Franz Bayer in the determination of fishes, he again publishes an up-to-date treatise, including the discoveries of the last quarter of a century. The work is illustrated in Dr. Fritsch's usual style, and a few of the figures are revised drawings of specimens previously described.

Dr. Bayer's chapter on the Cretaceous fishes was originally published in the Bohemian language in 1902, but is now made more readily accessible in German. He describes evidence of several new genera and species, and concludes that in the Bohemian Chalk there are more varied representatives of the higher fishes than have hitherto been found below the Tertiary formations. In view of the fragmentary nature of most of the fossils, it must be